

**EPA Superfund
Record of Decision:**

**ELLSWORTH AIR FORCE BASE
EPA ID: SD2571924644
OU 01
ELLSWORTH AFB, SD
05/10/1996**

FINAL

Record of Decision for
Remedial Action at Operable Unit 1
Ellsworth Air Force Base, South Dakota

United States Air Force
Air Combat Command
Ellsworth Air Force Base

April 1996

TABLE OF CONTENTS

Chapter	Page
1.0 DECLARATION FOR THE RECORD OF DECISION.....	1-1
1.1 SITE NAME AND LOCATION.....	1-1
1.2 STATEMENT OF BASIS AND PURPOSE.....	1-1
1.3 ASSESSMENT OF THE SITE.....	1-1
1.4 DESCRIPTION OF THE SITE.....	1-1
1.5 STATUTORY DETERMINATION.....	1-2
1.6 SIGNATURE AND AGENCY CONCURRENCE ON THE REMEDY.....	1-2
2.0 DECISION SUMMARY.....	2-1
2.1 SITE NAME AND LOCATION.....	2-1
2.2 OPERABLE UNIT 1 (OU-1) DESCRIPTION/HISTORY AND REGULATORY OVERSIGHT ACTIVITIES.....	2-1
2.2.1 Description/History.....	2-1
2.2.2 Regulatory Oversight Activities.....	2-2
2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION.....	2-3
2.4 SCOPE AND ROLE OF RESPONSE ACTION.....	2-4
2.5 SITE CHARACTERISTICS.....	2-5
2.5.1 Soils.....	2-5
2.5.2 Sediment.....	2-6
2.5.3 Ground Water.....	2-6
2.5.4 Surface Water.....	2-7
2.6 SITE RISK SUMMARY.....	2-7
2.7 DESCRIPTION OF ALTERNATIVES.....	2-9
2.8 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES.....	2-10
2.8.1 Overall Protection of Human Health and the Environment.....	2-11
2.8.2 Compliance with ARARs.....	2-11
2.8.3 Long-Term Effectiveness and Permanence.....	2-14
2.8.4 Reduction of Toxicity, Mobility, and Volume Through Treatment.....	2-14
2.8.5 Short-Term Effectiveness.....	2-15
2.8.6 Implementability.....	2-15
2.8.7 Cost.....	2-15
2.8.8 State Acceptance.....	2-17
2.8.9 Community Acceptance.....	2-17
2.9 SELECTED ALTERNATIVE.....	2-17
2.10 STATUTORY DETERMINATIONS.....	2-20
2.10.1 Protection of Human Health and the Environment.....	2-20
2.10.2 Compliance with ARARs.....	2-21
2.10.3 Cost Effectiveness.....	2-21
2.10.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Extent Possible.....	2-21
2.10.5 Preference for Treatment as a Principal Element.....	2-21
2.11 DOCUMENTATION OF SIGNIFICANT CHANGES.....	2-21
3.0 LIST OF ACRONYMS AND ABBREVIATIONS.....	3-1

APPENDICES

Appendix A	Figures
Appendix B	Responsiveness Summary

LIST OF FIGURES

Figure 2-1	Area Location Map
Figure 2-2	Site Map
Figure 2-3	Operable Unit 1
Figure 2-4	Area of Attainment for Source Area Soils
Figure 2-5	Area of Attainment for Ground Water

LIST OF TABLES

Table 2-1	OU-1 Cleanup Goals - Ground Water
Table 2-2	OU-1 Cleanup Goals - Soils
Table 2-3	Evaluation of Federal and State ARARs That May Apply to OU-1, Ellsworth AFB, South Dakota

1.0 DECLARATION FOR THE RECORD OF DECISION (ROD)

1.1 SITE NAME AND LOCATION

Operable Unit 1 (OU-1), Abandoned Fire Protection Training Area, Ellsworth Air Force Base (EAFB), National Priorities List Site.

Meade and Pennington Counties, South Dakota

1.2 STATEMENT OF BASIS AND PURPOSE

This decision document describes EAFB's selected remedial action for Operable Unit 1 (OU-1), in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This decision is based on the contents of the Administrative Record for OU-1, EAFB. The United States Environmental Protection Agency (EPA) and the South Dakota Department of Environment and Natural Resources (SDDENR) concur with the selected remedial action.

1.3 ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from OU-1, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, and the environment.

1.4 DESCRIPTION OF SELECTED REMEDY

Twelve contaminated areas, delineated as operable units (OUs) for investigative purposes, have been identified at EAFB. This ROD is for a remedial action at OU-1.

The selected alternative, source area soil and ground-water treatment, includes the following major components:

- Continued operation of the interim remedial action (IRA) which consisted of contaminated ground-water removal, soil vapor extraction (SVE), and treatment;
- Installation of additional SVE wells within the historical burn-pit area to be added to the existing IRA SVE system;
- Removal of contaminated ground water using additional ground-water wells and collection trenches to be added to the IRA ground-water recovery system;
- Treatment of ground water at the existing IRA treatment plant;
- Institutional controls for the area;
- Long-term monitoring; and,
- Long-term operation and maintenance of equipment.

1.5 STATUTORY DETERMINATION

The selected remedy is protective of human health and the environment, complies with Federal and the State of South Dakota requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies, to the maximum extent practicable for OU-1.

A review will be conducted no less often than every five years after signing of the ROD to ensure that the remedy continues to provide adequate protection of human health and the environment.

1.6 SIGNATURE AND AGENCY CONCURRENCE ON THE REMEDY

2.0 DECISION SUMMARY

2.1 SITE NAME AND LOCATION

EAFB IS U.S. Air Force Air Combat Command (ACC) installation located 12 miles east of Rapid City, South Dakota, and adjacent to the small community of Box Elder (Figure 2-1).

EAFB covers approximately 4,858 acres within Meade and Pennington counties and includes runways and airfield operations, industrial areas, and housing and recreational facilities (Figure 2-2). Open land, containing a few private residences, lies adjacent to EAFB on the north, south, and west, while residential and commercial areas lie to the east of the Base.

2.2 OPERABLE UNIT 1 (OU-1) DESCRIPTION/HISTORY AND REGULATORY OVERSIGHT ACTIVITIES

2.2.1 Description/History

Ellsworth Air Force Base (EAFB) was officially activate in July 1942 as the Rapid City Army Air Base, a training facility for B-17 bomber crews. It became a permanent facility in 1948 with the 28th Strategic Reconnaissance Wing as its host unit. Historically, EAFB has been the headquarters of operations for a variety of aircraft, as well as the Titan I Intercontinental Ballistic Missile, and the Minuteman I and Minuteman II missile systems. The Air Force has used EAFB for support, training, maintenance, and/or testing facilities. Presently, the 28th Bombardment Wing (B-1B bombers) is the host unit of EAFB.

OU-1 consists of the former Fire Protection Training Area (FPTA), Pond 001, and a portion of the drainage channel which leads into Pond 001. The former FPTA is approximately ten acres in size and is located in the southwestern segment of EAFB (Figure 2-3). The FPTA was operated by the EAFB Fire Department at this location form 1942 to 1990. The location of the burn area within the former FPTA has changed several times over the years. Aerial photographs of EAFB dated 28 May 1952, 8 October 1954, 25 August 1962 and 19 June 1968 show numerous areas of staining presumed to be a result of fire training activities within the former FPTA. The training exercises conducted at the FPTA involved simulation of aircraft fires and spills. Various types of fuels, oils, and solvents were dispersed within the burn-pit area and subsequently ignited and then extinguished.

The topography at OU-1 is characterized by a local topographic high in the area where fire training was conducted, which is bounded on the southwest and southeast by converging drainage channels. Pond 001 was included in OU-1 to determine if it contained contaminants which originated at the former FPTA.

A shallow aquifer has been identified at depths of 10 feet to 50 feet beneath the ground surface. This ground water is classified as having a beneficial use as a drinking water supply suitable for human consumption (ARSD Chapter 74:03:15, Groundwater Quality Standards). The shallow aquifer may also discharge to the surface.

Deeper bedrock aquifers also exist beneath EAFB. These deeper aquifers are separated from the shallow aquifer by 800 feet of low-permeability clays and silts. In the past, EAFB utilized these deeper aquifers for its water supply. Presently, EAFB obtains its potable water from the Rapid City Municipal Distribution System.

2.2.2 Regulatory Oversight Activities

Environmental investigation activities at EAFB were initiated by the Air Force in 1985 through an Installation Restoration Program (IRP) Phase I Installation Assessment/Records Search and Phase II, Confirmation/Quantification. The Phase I study, dated September, 1985, identified a total of 17 locations at EAFB where releases involving hazardous substances potentially occurred.

In Phase II of the IRP investigation, field activities included soil vapor surveys, geophysical surveys, surface and subsurface soil sampling, ground-water sampling, ground-water hydrologic testing, and ecological investigations.

On August 30, 1990 (55 Federal Register 35509), EAFB was listed on the U.S. EPA's National Priorities List (NPL). A Federal Facilities Agreement (FFA) was signed in January 1992 by the Air Force, EPA, and the State of South Dakota (State) and went into effect on April 1, 1992. The FFA establishes a procedural framework and schedule for developing, implementing, and monitoring appropriate response actions for EAFB in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). It also states the oversight procedures for EPA and the State to ensure Air Force compliance with the specific requirements. The FFA identified

11 site-specific operable units (OUs) and a Base-wide ground-water OU. The Base-wide ground-water OU is primarily used to address contaminated ground water that was not addressed during the investigation of a site-specific OU.

Listing on the NPL and execution of the FFA required the U.S. Air Force to perform a remedial investigation/feasibility study (RI/FS) to investigate the 12 OUs. In 1993 and 1994, an extensive RI field program was conducted to characterize conditions at OU-1. The program included drilling and sampling of boreholes, installation of ground-water monitoring wells, ground-water sampling, geotechnical analysis of soil samples, ecological evaluation, assessment of human health risks, and review and compilation of previous IRP investigations. Collection and laboratory analysis of soil, ground-water, surface-water, and sediment samples were included in the RI field program.

A ROD for an interim remedial action (IRA) for OU-1 was signed on 16 May 1995. The objectives of the IRA were (1) to remediate the deeper soils with the burn-pit area and (2) to remediate ground-water contamination immediately downgradient from the burn-pit area. The remediation of the deeper soils within the burn-pit area consists of a soil vapor extraction system and subsequent treatment by thermal oxidation. The remediation of contaminated ground water immediately downgradient of the burn-pit area consists of removal of contaminated ground-water using wells and an existing ground-water recovery trench. Treatment of the contaminated ground water consists of filtration, air stripping, and activated-carbon adsorption. The treatment system was constructed as part of the IRA.

2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION

Community relations activities that have taken place at EAFB to date include:

- FFA process. After preparation of the FFA by the USAF, EPA, and SDDENR, the document was published for comment. The FFA became effective April 1, 1992.
- Administrative Record. An Administrative Record for information was established in Building 8203 at EAFB. The Administrative Record contains information used to support USAF decisions. All the documents in the Administrative Record are available to the public.
- Information repositories. An Administrative Record outline is located at the Rapid City Library (public repository).
- Community Relations Plan (CRP). The CRP was prepared and has been accepted by EPA and the State of South Dakota and is currently being implemented. An update to this plan will be prepared in 1996.
- Restoration Advisory Board (RAB). The RAB has been formed to facilitate public input in the cleanup and meets quarterly. In addition to USAF, EPA, and South Dakota oversight personnel, the RAB includes community leaders and local representatives from the surrounding area.
- Mailing list. A mailing list of all interested parties in the community is maintained by EAFB and updated regularly.
- Fact sheet. A fact sheet describing the status of the IRP at EAFB was distributed to the mailing list addresses in 1992.
- Open house. An informational meeting on the status of the IRP and other environmental efforts at EAFB was held on May 6, 1993. An open house was held November 16, 1995 in conjunction with the Restoration Advisory Board meeting. Information on the status of environmental efforts at EAFB was provided at the open house.
- Newspaper articles. Articles have been written for the Base newspaper regarding IRP activity.
- Proposed Plan. The proposed plan on this action was distributed to the mailing list addressees for their comments.

A public comment period was held from September 18, 1995 to October 18, 1995, and a public meeting was held on September 26, 1995. At this meeting, representatives from EAFB answered questions about the remedial action. A response to the comments received during this period is included in the Responsiveness Summary, which is part of this Record of Decision (ROD).

This ROD is based on the contents of the Administrative Record for OU-1, in accordance with the CERCLA, as amended by SARA, and the NCP. The RI/FS reports and the Proposed Plan for OU-1 provide information about OU-1 and the selected remedy. These documents are available at the Information Repositories at EAFB and the Rapid City Public Library.

2.4 SCOPE AND ROLE OF RESPONSE ACTION

The FFA identified 11 site-specific OUs and a Base-wide ground-water OU. The 12 operable units are identified as follows:

- OU-1 Fire Protection Training Area
- OU-2 Landfills Nos. 1 and 6
- OU-3 Landfill No. 2
- OU-4 Landfill No. 3
- OU-5 Landfill No. 4
- OU-6 Landfill No. 5
- OU-7 Weapons Storage Area
- OU-8 Explosive Ordnance Disposal Area (Pramitol Spill)
- OU-9 Old Auto Hobby Shop Area
- OU-10 North Hangar Complex
- OU-11 Base-wide Ground Water
- OU-12 Hardfill No. 1

This ROD documents the selected remedial action (RA) at OU-1 and is the fourth ROD for EAFB. The remedial action objectives (RAOs) are: (1) the cleanup of ground water to regulatory levels and, for contaminants where regulatory levels are not available, to levels considered safe for public drinking water, and (2) the cleanup of source area soils to levels that would not pose a threat of contaminating ground water.

The development of alternatives was conducted under EPA's Presumptive Remedies Approach [Presumptive Remedies: Policy and Procedures (OSWER Directive 9355.0-47FS): Presumptive Remedies: Site Characterization and Technology Selection for CERCLA Sites with Volatile Organic Compounds in Soils (OSWER Directive 9355.0-48FS)]. Using this approach, selecting an alternative for remediation is streamlined by using preferred technologies based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of performance data on technology implementation.

The presumptive remedy stipulates soil vapor extraction (SVE) as the primary remedy for soils that are contaminated with volatile organic compounds (VOCs). In addition, thermal desorption is being retained as a secondary source area soil treatment option. The response action, source-area soil and ground-water treatment, combines the presumptive remedies for soil with ground-water extraction and treatment to reduce risk associated with the ingestion exposure pathway.

The area over which remediation goals would be achieved is defined as the area of attainment, and is based on the RAOs. The area of attainment would include areas within OU-1 which present an unacceptable risk to human health or the environment.

2.5.1 SITE CHARACTERISTICS

This section describes the presence and distribution of contaminants at OU-1 as a result of past activities.

2.5.1 Soils

Organic Contaminants

Organic compounds reported in soil samples from OU-1 include volatile organic compounds (VOCs), jet fuel, semivolatile organic compounds (SVOCs), pesticides, and dioxins/furans. Total petroleum hydrocarbon (TPH) concentrations, analyzed as jet fuel, above the State of South Dakota action level (500ppm) were reported in 4 surface-soil samples and 11 capillary fringe soil samples located in and adjacent to the burn pit. Soil which has been impacted by past activities at OU-1 extends from the surface to the capillary fringe beneath the former FPTA, and within the capillary fringe from the former FPTA to approximately 800 feet to the south.

In general, the most prevalent organic contaminant in the soil is jet fuel. The State of South Dakota regulations for petroleum-contaminated soils have been recently revised and effective December 18, 1995; new risk-based criteria are used to determine if petroleum-contaminated soil requires removal or

treatment. The new regulations establish a three-tiered approach in determining what action will be taken at petroleum release sites (ARSD Chapter 74:03:13). The regulations establish Tier 1 action levels for five petroleum related components (benzene, ethylbenzene, toluene, xylene, and naphthalene) and TPH. Two of the five chemicals (benzene and ethylbenzene) for which soil action levels have been established by the State were detected in the soil above their respective action levels in three different boring in the vicinity of the burn pit. Concentrations of TPH (as jet fuel) in the soil were above the 500 ppm Tier 1 action limit in 12 different soil boring locations in and around the burn pit area. Based on this, a Tier II evaluation is required. Because pathways and receptors are present, remediation of jet fuel is required. Also, State guidance concerning the need for installation of monitoring wells at a petroleum release site (Handbook for Investigation and Corrective Action Requirements for Discharges from Storage Tanks, Piping Systems, and Other Releases, SDDENR Ground-Water Quality Program, Version 1.1, December 18, 1995) indicates that monitoring wells will be required at this site.

Inorganic Contaminants

In general, the subsurface-soil samples which contained the highest concentrations of inorganic compounds were from the former burn-pit area. The source of the inorganic compounds in OU-1 subsurface-soil samples is believed to be from a combination of burn pit activities and naturally-occurring geologic deposits and soil type. No distinct pattern was observed for the higher concentrations of inorganic compounds in OU-1 surface-soil samples.

2.5.2 Sediment

Organic Contaminants

VOCs, SVOCs, and pesticides were reported in sediment samples collected from the drainage channel both upgradient and downgradient of OU-1, from within the drainage channel at OU-1, and within Pond 001. Although OU-1 may have contributed to the contaminants in sediment, the presence of these organic compounds in samples collected upstream of OU-1 indicates that the primary source of contaminants in sediments is from areas upgradient of OU-1. The highest concentrations of contaminants were in Pond 001 where sediments are likely to build up over time. It is not possible to distinguish the exact source of contaminants in the sediments in the pond. Possible upgradient sources for the organic compounds in sediment samples are the operations areas along the taxiways and flightlines.

Inorganic Contaminants

Many of the inorganic analytes were reported only once in each of the nine sediment samples with the exception of cyanide, thallium, and mercury. The source of the inorganic analytes is thought to be a combination of surface-water runoff from both outside and within OU-1 as well as naturally-occurring geologic deposits and soil type.

2.5.3 Ground Water

Organic Contaminants

Contaminants were found in ground-water samples from both within and downgradient of the former FPTA. The most frequently reported organic contaminant in ground-water samples from OU-1 were VOCs. SVOCs were reported in ground-water samples to a lesser extent. VOCs and SVOCs in the ground water area a result of historical use of fuels, waste oils, and solvents in the burn-pit area. Seven VOCs, one SVOC, and one pesticide were reported at least once at concentrations exceeding the Safe Drinking Water Act Maximum Contaminant Level (MCL).

Inorganic Contaminants

Thirteen inorganic compounds were detected in ground-water samples at concentrations which were above general background levels. However, due to variations in soil type and geologic deposits, localized high concentrations of inorganic compounds in the EAFB area are common. Two-compounds, manganese and antimony, were reported at least once at concentrations exceeding the MCL. Regional and site-specific background results indicate that these two inorganic compounds naturally occur at levels in ground water that exceed the MCL and their presence is not thought to be a result of historical activities at OU-1. Arsenic was reported in four ground-water samples at concentrations of two to six times background from locations within and downgradient of the burn pit. In general, the remaining inorganic compounds were also detected in samples from locations within, and immediately downgradient of, the burn-pit area. The source of the remaining inorganic compounds is considered to be primarily a result of historical activities at the FPTA, although some compounds may be a result of the natural variations in soil type and geologic deposits.

2.5.4 Surface Water

Organic Contaminants

Three VOCs, one phthalate, and one polynuclear aromatic hydrocarbon (PAH) were reported in surface-water samples from the drainage channel and Pond 001. The organic compounds reported in surface-water samples were not reported in soil or ground-water samples from within OU-1 and are believed to be a result of surface spills outside of OU-1.

Inorganic Contaminants

Of the inorganic contaminants detected in surface-water samples, arsenic, manganese and nickel exceeded Federal Ambient Water Quality Criteria (FAWQC) and State Water Quality Standards. The source of the inorganic analytes in OU-1 surface-water samples is not known, but is suspected to be from the flightline area, which is upstream and outside of OU-1.

2.6 SITE RISK SUMMARY

Human Health Risks

Risk Assessment Process

The assessment of human health risks for this OU considered the following topics:

- (1) Chemicals of concern (COCs) in ground-water, surface water, sediment, and soil samples taken at OU-1;
- (2) Current and future land-use conditions;
- (3) Potential environmental pathways by which populations might be exposed;
- (4) Estimated exposure point concentrations of COCs;
- (5) Estimated intake levels of the COCs;
- (6) Toxicity of the COCs; and
- (7) Uncertainties in the assessment of exposure, toxicity, and general risks.

Noncarcinogenic and carcinogenic risks were calculated for the following five potential exposure groups:

- (1) Current EAFB maintenance personnel mowing grass on-site;
- (2) The future child/adult living on-site who ingests surface soil;
- (3) The future adult living on-site who ingests and showers with shallow ground water;
- (4) Future adolescents who are exposed to surface water and sediment through wading; and,
- (5) Future adult construction workers who excavate on-site for building residences.

A quantitative risk assessment was performed for the ground water, surface water, soil, sediment, and air. The risk assessment evaluated potential effects on human health posed by exposure to contaminants from OU-1. Carcinogenic risks were estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a potential cancer-causing chemical. The acceptable risk range expressed as a probability is one cancer incidence in ten thousand people to one cancer incident in a million people. This level of risk is also denoted by 1×10^{-4} to 1×10^{-6} . Risks within the acceptable risk range may or may not warrant remedial action depending upon site-specific circumstances. Risks below this range cannot be differentiated from the background occurrence of cancer in human populations. Risks calculated in a risk assessment are excess (i.e., over background) cancer risks due to exposure from contaminants.

Noncarcinogenic health risks are evaluated using a hazard index (HI). If the hazard index is less than or equal to one, the contaminant concentration is considered an acceptable level and generally assumes that the human population may be exposed to it during a 30-year period without adverse health effects.

Risk Assessment Results

The risk assessment for OU-1 indicated unacceptable risk in the shallow ground water for the residential exposure scenarios. The chemicals which contributed the majority of the risk in shallow ground water were VOCs. Of the VOCs, benzene, 1,2-dichloroethane, (1,2-DCA) 1,1-dichloroethylene (1,1-DCE), 1,2-dichloroethylene (1,2-DCE), 1,1,1-trichloroethane, perchloroethylene (PCE), trichloroethylene (TCE), and vinyl chloride were identified as being above their respective MCLs.

The risk assessment indicated that unacceptable risk exists in the soils of the burn-pit area, primarily from the potential for contaminating the underlying ground water. In order to prevent future contamination of the ground water, four VOCs were identified for remediation in soils: benzene, 1,2-DCE, PCE, and TCE. These chemicals were selected for remediation on the basis of a contaminant transport mode. Remediation of jet fuel in the soil at OU-1 is also required because concentrations of jet fuel (and related components) exceed State of South Dakota regulations. Risks from exposure to pesticides and dioxins/furans in surface and subsurface soils at OU-1 were well below the acceptable range and do not warrant remediation.

The risk from the contaminants in the sediments and surface water at OU-1 is within the acceptable risk range. Several compounds were detected in surface water at above the FAWQC, but the risk to human health from these contaminants is within the acceptable risk range. Because of the risk being within the acceptable risk range, remediation of these chemicals in surface water and sediment is not warranted.

Risk Assessment Conclusions

Remediation of the ground water is warranted based on the risk to human health from ingesting and contacting contaminated ground water. Remediation of soil is warranted based on the potential for contaminants in the soil to be transported to the underlying ground water. Actual or threatened releases of hazardous substances from OU-1, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, and the environment.

Ecological Risks

An ecological risk evaluation of OU-1 was based on a combination of data and literature reviews, field and laboratory analyses, analyte evaluation and screening, and preliminary risk screening. The pertinent finding are summarized below.

A variety of animal species may live, forage, or nest in OU-1 habitats. These species include various types of invertebrates, amphibians, birds, and mammals. Terrestrial vegetation and soil faunal communities do not reveal characteristics that indicate chemical-related impacts. This finding is consistent with the relatively low levels of contaminants in the soil.

Because of the altered natural environment at OU, rare, threatened, or endangered species are unlikely to utilize the area for more than brief, periodic habitat. Due to the low levels of contaminant concentrations and the identified exposure pathways, the contaminants do not pose an unacceptable risk to these species. In addition, the limited contact these species would have with the OU-1 area ensures unacceptable risk to a single individual will not occur.

Findings of the RI indicate that the contaminants at OU-1 are not altering the ecology to unacceptable levels. A Base-wide ecological risk assessment will be conducted as part of OU-11, and OU-1 will be included in this Base-wide evaluation.

2.7 DESCRIPTION OF ALTERNATIVES

Presumptive Remedies: Site Characterization and Technology Selection for CERCLA Sites with Volatile Organic Compounds in Soils (OSWER Directive 9355.0-48FS) was the basis of the streamlined feasibility study (FS). This presumptive remedy was incorporated into the remedial action at OU-1 to develop the following alternatives.

Alternative 1 - No Further Action

- The no further action alternative represents the baseline condition at OU-1 and refers to taking no further action at the operable unit.

Alternative 2 - Source Area Soil Treatment with Ground-water Containmentment

- Continued operation of the interim remedial action (IRA).
- Installation and use of additional SVE wells, ground-water wells and/or collection trenches to contain the existing soil and ground-water contamination.
- Soil gas and contaminated ground water would be treated at the IRA treatment plant. The effluent will either be discharged to a surface water drainage, pumped to the Base waste-water treatment plant, or injected underground.
- Long-term maintenance and monitoring.
- Institutional controls (access restrictions and deed restrictions).

Alternative 3 - Source Area Soil Treatment and Ground-water Treatment

- Same as Alternative 2 with additional ground-water removal system

This alternative is the same as Alternative 2 except that the ground-water removal system would be designed to not only contain the contaminated ground water, but to permanently lower the contaminant concentration in the ground water to the levels listed in Table 2-1.

2.8 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The analysis of alternatives coupled with the use of the presumptive remedy combine for a narrower range of feasible approaches to address remedial activities at OU-1.

The remedial action objectives for OU-1 are as follows:

- Achieve the ground-water clean-up goals set forth in Table 2-1.
- Achieve the soil clean-up goals set forth in Table 2-2.

The area of attainment is defined as the area which will achieve the remedial action objectives after remediation is completed. The real extent of the source-area soil attainment area for OU-1 is based on reported concentrations of chemicals of concern and is shown in Figure 2-4. The ground-water attainment area was based on MCLs for the reported chemical concentrations at OU-1 and is shown in Figure 2-5.

Pursuant to Section 40 CFR 300.430(e)(9)(iii), the remedial action to be implemented should be selected based upon consideration of nine evaluation criteria. These are as follows:

1. Overall protection of human health and environment.
2. Compliance with applicable or relevant and appropriate requirements (ARARs).
3. Long-term effectiveness and permanence.
4. Reduction of toxicity, mobility, or volume of contamination.
5. Short-term effectiveness.
6. Implementability.
7. Cost
8. State acceptance.
9. Community acceptance.

The following sections provide a brief review and comparison of the remedial alternatives according to EPA's evaluation criteria.

2.8.1 Overall Protection of Human Health and the Environment

The assessment of this criterion considers how the alternatives achieve and maintain protection of human health and the environment.

Alternative 1 does nothing to reduce risk levels at OU-1. Alternatives 2 and 3 both reduce the risk of source-area soils contaminating the underlying aquifer and address ground-water remediation. Alternatives 2 and 3 would remediate ground water to levels at or below MCLs. However, the primary goal of Alternative 2 is to only contain contaminated ground water. Under Alternative 2, the aquifer may eventually be restored to the levels listed in Table 2-1. It would take approximately 10-15 years longer for the ground water to be remediated to levels listed in Table 2-1 under Alternative 2 as compared to

Alternative 3.

2.8.2 Compliance with ARARs

Alternatives are assessed under this criterion in terms of compliance with ARARs. Applicable requirements include cleanup standards, of control and other substantive environmental protection requirements, criteria or limitations promulgated under Federal or State of South Dakota laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstances at a CERCLA site.

Relevant and appropriate requirements address problems that do not specifically address a hazardous substance, pollutant, or remedial action. Rather, these requirements address problems or situations that are similar to those encountered at a particular CERCLA site, and therefore, these requirements are suited for use at the site because of these similarities. ARARs are grouped into these three categories:

- Chemical-Specific ARARs are health or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in establishment of the amount or concentration that may be found in, or discharged to, the environment.
- Location-Specific ARARs restrict the concentration of hazardous substances or the conduct of activities solely because they are in specific locations such as flood plains, wetlands, historic places, and sensitive ecosystems or habitats.
- Action-Specific ARARs are usually technology or activity-based requirements or limitations on actions taken with respect to hazardous wastes.

A summary evaluation of Federal and State ARARs pertinent to this remedial action is provided in Table 2-3 at the end of Section 2.0 and a narrative discussion of compliance with ARARs is provided below for the alternative considered.

Alternative 1 (No Action):

Since there are no remedial activities currently being conducted and none are proposed under this alternative, there are no remediation ARARs applicable. The No Action alternative does not comply with CERCLA ARARs as a stand-alone action. The ground water at the site would remain contaminated.

Alternatives 2 and 3 (Source Area Soil Treatment with Ground-water Containment/Treatment):

The Safe Drinking Water Act will be complied with by extracting and treating ground water so that contaminant concentrations in the shallow aquifer are below the MCLs. State ground-water quality standards (ARSD Chapter 74:03:15) will also be complied with. However, compliance with MCLs will take approximately 10-15 years longer under Alternative 2 as compared to Alternative 3. The discharge of the treated ground water will comply with State of South Dakota discharge requirements (ARSD Chapter 74:03:17 for indirect or direct discharges into surface waters and ARSD Chapter 74:03:13 for reinjection of discharged water underground). State discharge requirements comply also with Federal requirements of the Clean Water Act (CWA). The proposed SVE system will reduce the concentrations of JP-4 in the soils to levels in compliance with South Dakota Petroleum-Contaminated Soils regulations (ARSD Chapter 74:03:33).

Treatment-process residuals such as spent carbon will be disposed of in a manner complying with State and Federal solid waste disposal restrictions (40 CFR 268). Construction of the collection trench will not degrade onsite wetlands and therefore will comply with the Executive Order on Protection of Wetlands and Section 404 of the CWA. Air and water discharges from the IRA treatment facility will comply with South Dakota Air Pollution Control Regulations (ARSD Chapter 74:26) and water discharge permit rules and water quality standards as stated above.

2.8.3 Long-Term Effectiveness and Permanence

The assessment of this criterion considered the long-term effectiveness of alternatives in maintaining protection of human health and the environment after response action objectives have been met.

Alternative 1 does not provide long-term effectiveness in achieving the remedial action objectives established for this site. No further controls for the OU would be developed under this alternative.

TABLE 2-1
OU-1 Clean-up Goals
Ground Water ($\mu\text{g/L}$)

Analyte	Clean-up Goal	Basis
1,2-Dichloroethane (1,2-DCA)	5.0	MCL
1,1-Dichloroethylene (1,1-DCE)	7.0	MCL
1,2-Dichloroethylene (1,2-DCE)	70.0	MCL
1,1,1-Trichloroethane	5.0	MCL
Benzene	5.0	MCL
Tetrachloroethylene (PCE)	5.0	MCL
Trichloroethylene (TCE)	5.0	MCL
Vinyl Chloride	2.0	MCL
TPH	10,000	State Regulation
Ethylbenzene	700	State Regulation
Toluene	1,000	State Regulation
Xylene	10,000	State Regulation

TABLE 2-2
OU-1 Clean-up Goals
Soils ($\mu\text{g/kg}$)

Analyte	Clean-up Goal	Model Estimates(1)	Basis
1,2-Dichloroethylene(1,2-DCE)	41	41.4	Ground water protection
Benzene	10(2)	2.5	Ground water protection
Tetrachloroethylene (PCE)	10	10.5	Ground water protection
Trichloroethylene (TCE)	10(2)	3.3	Ground water protection
JP-4	500,000(3)	-	State Regulation
Toluene	15,000(3)	-	State Regulation
Ethylbenzene	10,000(3)	-	State Regulation
Xylene	300,000(3)	-	State Regulation
Naphthalene	25,000(3)	-	State Regulation

(1)Note: Based on SUMMERS Model (Summers, 1980)

(2)Note: When the model estimates are less than standard detection limits, remediation clean-up goals will be based on standard detection limits.

(3)Note: State of South Dakota Remediation Criteria for Petroleum Contaminate Soil, Tier 1 action levels at petroleum release sites which would require a corrective action plan or Tier 2 analysis (ARSD Chapter 74:03:33).

For Alternative 2 and 3, residual risk levels would be low enough that source-area soils would not pose a risk to ground water. MCLs would be met for ground water. However, it would take approximately 10-15 years longer for the ground water to be remediated to the MCLs under Alternative 2 as compared to Alternative 3. The ground-water collection system for Alternative 2 would be designed to preclude further transport of the ground-water contamination. The ground-water collection system for Alternative 3 would be designed to also remediate the ground water to the levels listed in Table 2-1. Long-term monitoring of vapor extraction rates and concentrations would be necessary to maintain proper system operation.

2.8.4 Reduction of Toxicity, Mobility, and Volume Through Treatment

The assessment of this criterion involves considering the anticipated performance of specific treatment technologies an alternative may employ.

No reduction of potential source area chemicals with respect to toxicity, mobility, or volume would be achieved with Alternative 1. Alternatives 2 and 3 would reduce the volume of VOCs in source-area soils to levels protective of ground-water quality. The ground-water collection system would reduce the mobility of the ground-water quality. The ground-water collection downgradient movement. The removal and treatment of contaminants would also reduce the volume of contaminated ground water. The volume of contaminated ground water would be reduced faster under Alternative 3 as compared to Alternative 2.

2.8.5 Short-Term Effectiveness

The assessment of this criterion considers the effectiveness of alternatives in maintaining protection of human health and the environment during the construction of a remedy until response action objectives have been met.

Alternative 1 does not provide any short-term effectiveness in reducing potential threats from this site to human health or the environment. Since no construction activities would take place, risk from remedial action would not exist.

Adverse environmental impacts due to the construction and implementation of Alternatives 2 and 3 are expected to be minor. Construction would comply with OSHA requirements to help eliminate the risk to construction workers. Community risk is expected to be minimal due to low levels of contaminants in the surface soil and dust control measures would be implemented.

2.8.6 Implementability

The assessment of this criterion considers the administrative and technical feasibility of implementing the alternatives and the availability of necessary goods and services for implementation of the response action.

There is nothing to implement under Alternative 1. Alternatives 2 and 3 require no special or unique activities and could be implemented using locally available materials and contractors. Any implementability concerns were addressed during the IRA.

2.8.7 Cost

The assessment of this criterion considers the capital and operation and maintenance (O&M) costs associated with each of the alternatives. Alternatives are evaluated for cost in terms of both capital costs and long-term O&M costs necessary to ensure continued effectiveness of the alternatives. Capital costs include the sum of the direct capital costs (materials and labor) and indirect capital costs (engineering, licenses, permits). Long-term O&M costs include labor, materials, energy, equipment replacement, disposal, and sampling necessary to ensure the future effectiveness of the alternative. The objective of the cost analysis is to evaluate the alternatives based on the ability to protect human health and the environment for additional costs that may be incurred. A summary of the costs for each alternative is as follows:

Alternative No. 1 (No Action)

Total Capital Costs	\$0
Total Annual (Sampling/Analysis) Costs	\$0
30-Year Present Value for Annual Costs	\$0
Annual Cost=\$0	
Years=30	
Discount Rate=5%	
TOTAL 30-Year Present Value	\$0

Alternative No.2 (Source Area Soil Treatment and Ground-water Containment)

Total Capital Costs	\$782,000
Total Annual (Sampling/Analysis/O&M) Costs	\$150,000
30-Year Present Value for Annual Costs	\$2,306,000
Annual Cost=25,000	
Years=30	
Discount Rate=5%	
TOTAL 30-Year Present Value	\$3,088,000

Alternative No. 3 (Source Area Soil Treatment and Ground-water Treatment)

Total Capital Costs	\$986,000
Total Annual (Sampling/Analysis/O&M) Costs	\$96,000
30-Year Present Value for Annual Costs	\$1,479,000
Annual Cost=\$25,00	
Years=30	
Discount Rate=5%	
TOTAL 30-Year Present Value	\$2,465,000

The majority of the costs for Alternatives 2 and 3 are from long-term monitoring and maintenance. The capital costs for Alternative 3 are approximately \$204,000 greater than the capital costs for Alternative 2. This is due to the additional ground-water extraction wells and/or trenches needed to remediate the ground water Alternative 3 rather than contain the ground water under Alternative 2. Because Alternative 2 will operate approximately 10-15 years longer than Alternative 3, the long-term monitoring and maintenance costs are much greater for Alternative 2. These additional long-term monitoring and maintenance costs are much greater than the additional capital costs to remediate the ground water under Alternative 3. Alternative 3 is the most cost-effective alternative.

2.8.8 State Acceptance

The assessment of this criterion considered the State's preferences for or concerns about the alternatives.

The State concurs with the selected remedy. The State provided comments on the remedial investigation, feasibility study, and Proposed Plan. In accordance with the requirements of the NCP, the State of South Dakota was also provide the opportunity to review and comment on the ROD. As a result of that review and after incorporating adequate responses to the comments into the respective documents, the State concurred with the remedy.

2.8.9 Community Acceptance

Comments offered by the public were used to assess the community acceptance of the proposed alternative. The community expressed their concerns about the selected remedy during the public comment period. The

questions and concerns of the community are discussed in detail in the Responsiveness Summary, which is Appendix B of the ROD. Community members did not express any concerns about the Proposed Plan which would require a change in the chosen alternative.

2.9 SELECTED ALTERNATIVE

Based on the requirements of CERCLA, comparative analysis of the nine criteria, public comments, and in consultation with EPA and the State, the Air Force has determined that the selected alternative is Alternative 3, Source Area Soil Treatment and Ground-water Treatment. This alternative includes institutional controls in conjunction with physical modification of the OU to reduce potential risk. Five-year reviews of the remedy will be required because contaminants at OU-1 will remain above health-based levels following completion of installation of the extraction components of the remedy. Major components of Alternative 3 are:

- Continued operation of the IRA which consists of (1) SVE to remediate a portion of the source area soils and (2) ground-water wells and an existing collection trench to remove contaminated ground water near the source area.
- Installation and use of additional SVE wells, ground-water wells and/or collection trenches.
- Soil gas and contaminated ground water would be treated at the IRA treatment plant. The water effluent will either be discharged to surface water, injected underground, or discharged to the Base waste-water treatment plant.
- Implementing institutional controls (deed and land use restrictions) to restrict the future use of the area while the remedy is being implemented.
- Providing for long-term ground-water monitoring at the OU to identify development of future risks associated with the OU. Providing long-term maintenance of the remedial actions taken at the OU.

Each of these items is discussed below.

Continued Operation of the IRA

The IRA consisted of (1) SVE to remediate a portion of the source area soils and (2) ground-water wells and an existing collection trench to remove contaminated ground water near the source area. The IRA also included the construction of a treatment plant for the treatment of the soil gas and contaminated ground water. The IRA will be operated and the additional SVE wells, ground-water wells, and collection trenches described below will be added to the system.

SVE Wells, Ground-Water Wells and/or Trenches

The objective of this alternative is to decrease soil contaminant concentrations within the burn-pit to the levels listed in Table 2-2 and to remediate the shallow aquifer to levels listed in Table 2-1.

The area targeted for SVE is the burn-pit area (Figure 2-4). Additional SVE wells will be placed in the burn-pit area to remove soil contamination that was not addressed in the IRA. The number and placement of the SVE wells will be further evaluated during the design.

Ground-water wells and/or collection trenches will be installed at OU-1 to remediate the contaminated shallow aquifer at OU-1 to the levels listed in Table 2-1. The number and placement of wells and/or trenches will be evaluated during the design. The ground-water wells and trenches will collect and remove contaminated ground water at OU-1. The aquifer is expected to be remediated in 10-15 years.

Treatment

Extracted soil gas, condensate from the SVE wells, and ground water removed by wells and trenches will contain both VOCs and petroleum hydrocarbons. These contaminants will be treated at the treatment plant built for the IRA. Treatment of the soil gas and contaminated ground water consists of filtration, air stripping, activated-carbon adsorption, and thermal oxidation.

The water effluent from the treatment plant is expected to be discharged into a drainage which flows into Pond 001. The effluent will be monitored prior to discharge to determine the effectiveness of the treatment system. Effluent discharge standards and monitoring will be determined during the design phase

and are subject to State and EPA reviews and approvals. Underground injection or discharge to the Base waste-water treatment plant may be chosen as the discharge option based on the allowable discharge standard. The expected surface water discharge will comply with the requirements of the Clean Water Act. Off-gas from the thermal oxidizer will be monitored to ensure compliance with Federal, State, and local requirements under the provisions of the Clean Air Act.

Institutional Controls

Institutional controls will be implemented to prevent human exposure to contaminated soil and ground water. These controls will include: (1) issuing a continuing order to restrict on-site worker access to contaminated soil, and to restrict or control temporary construction activities unless proper protective equipment is worn; (2) filing a notice with the State to recommend denial of water appropriation permit applications to install ground-water well restrictions; and contamination and any area which may be effected by potential contaminants; (3) filing a notice to the deed detailing the restrictions of the continuing order and ground-water well restrictions; and (4) a covenant to the deed in the event of property transfer.

Continuing order requirements will be in effect as long as the property is owned by Ellsworth AFB and the remedial action has not reached remediation goals. In the case of the sale or transfer of property within OU-1 by the United States to any other person or entity, the Air Force will place covenants in the deed which will restrict access and prohibit disturbance of contaminated soils or the remedial action without approval of the United States. These covenants will be in effect until removed upon agreement of the State of South Dakota, the U.S. Environmental Protection Agency, and the U.S. Air Force or their successors in interest. The Air Force will also include in the deed the covenants required by section 120(h)(3) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), which include (1) a warranty that the United States will conduct any remedial action found to be required by law after the date of the transfer; (2) a right of access in behalf of EPA and the Air Force or their successors in interest to the property to participate in any response or corrective action that might be required after the date of transfer. The right of access referenced in the preceding sentence shall include the State of South Dakota for purposes of conducting or participating in any response or corrective action that might be required after the date of transfer.

Long-Term Monitoring and Maintenance

A maintenance program would be established to ensure the long-term integrity of the removal and treatment system. The maintenance program would include development of standard operating procedures (SOPs) to provide for inspections, repairs, and leak response actions.

A long-term monitoring program will be developed and implemented during remedial action and is subject to approval of both EPA and SDDENR. Contaminant concentrations from the treatment plant vapor stream and treated ground water will be monitored to evaluate the effectiveness of the system in removing VOCs from the contaminate media. Continued concentrations in the burn-pit area and in the ground water will also be monitored. Continued analysis and monitoring of the ground-water remedial action system performance will be conducted to determine if there mediation system is approaching an asymptotic level due to physical limitation of the site, or the benefits of the remedial action no longer justify long-term operation of the system. Remediation goals and the remedial alternative will be re-evaluated at that time.

This alternative will meet the remedial action objectives and reduce the potential risk at OU-1 by treating contaminated ground water to levels considered safe for public drinking water and by preventing future contamination of the shallow aquifer by reducing the volume of contaminants in the soil above the shallow aquifer. This will be achieved by the installation of ground-water wells and/or collection trenches, installation of SVE wells, ad treatment of removed ground water and soil vapor.

Alternative 3 would achieve significant risk reduction at the OU by treating ground water to reduce contaminant concentrations to below the MCLs. The selected alternative will be protective of human health and environment and will comply with ARARs.

2.10 STATUTORY DETERMINATIONS

The selected remedy meets the statutory requirements of Section 121 of CERCLA as amended by SARA. These requirements include protection of human health and the environment, compliance with ARARs, cost effectiveness, utilization of permanent solutions and alternative treatment technologies to the extent practicable. The selected remedy represents the best balance of tradeoffs among the alternatives considered, with respect to pertinent criteria, given the scope of the action.

The manner in which the selected remedy meets each of these requirements is discussed in the sections below.

2.10.1 Protection of Human Health and the Environment

The selected remedy addresses health and environmental issues that were identified in the OU-1 RI report. Specifically, the alternative:

- Reduces contaminant concentrations in ground water to MCLs.
- Reduces the potential infiltration of contaminants to the ground water.
- Prevents unauthorized access and use of the area while remediation is taking place thereby preventing exposure to contaminants by Base personal potential future residents.
- Provides for long-term monitoring of ground water identify potential future risks associated with OU-1.

2.10.2 Compliance with ARARs

Alternative 3 meet Safe Drinking Water Act MCLs and South Dakota Ground Water Quality Standards (ARSD Chapter 74:03:13). Treated discharge water will comply with the requirements of an NPDES permit. The proposed SVE system will reduce concentrations of JP-4 to comply with South Dakota Petroleum-Contaminated Soils regulations. Additional information about ARAR compliance is contained in Section 2.8.2.

2.10.3 Cost Effectiveness

The selected remedy has been determined to provide overall effectiveness proportional to its costs and is therefore considered cost effective. The presumptive remedy process insures cost effective remedies are chosen. The estimated costs of the selected remedy are less than the costs associated with a similar alternative that utilizes only ground-water containment. The selected remedy provides a higher degree of protectiveness at a lower cost than the containment alternative. All the technologies included in the remedy are readily implementable and have been widely used and demonstrated to be effective.

2.10.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Possible

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for OU-1. EPA has established that SVE has proven effective in remediating soils containing VOCs. This alternative prevents unauthorized access and provides for long-term ground water monitoring to detect movement of chemicals from the area. A review will be conducted no less often than every five years after the signing of the ROD to ensure the remedy continues to provides adequate protection of human health and the environment.

2.10.5 Preference for Treatment as a Principal Element

Treatment of soil within the former FPTA and contaminated ground water satisfies the statutory requirement of treatment as a principal element.

2.11 DOCUMENTATION OF SIGNIFICANT CHANGES

The selected action is the same as the preferred alternative presented in the Proposed Plan for OU-1 remedial action. There have been no changes relative to the Proposed Plan.

TABLE 2-3 EVALUATION OF FEDERAL AND STATE ARARS THAT MAY APPLY TO OU-1, ELLSWORTH AFB, SOUTH DAKOTA

A. Potentially Applicable' or Relevant and Appropriate Federal Standards, Requirements, Criteria and Limitations				
Standard Requirement, Criteria, or Limitation	Citation	Description	ARAR Type	Applicability to OU-1
Safe Drinking Water Act	42 USC 300g			
National Primary Drinking Water Regulations	40 CFR Part 141 60-63	Establishes health based standards for public water systems (maximum containment levels)	Chemical	Relevant and appropriate for Federal Class II aquifer.
National Secondary Drinking Water Standards	40 CFR Part 143.03	Establishes welfare based standards for the public water systems (secondary maximum contaminant levels)	Chemical	Relevant and appropriate.
Maximum Contaminant Level	40 CFR 141.50 and	Establishes drinking water quality goals set at Chemical Pub. L. No. 99-330, 100 Stat.642(1986) health effects, with an adequate margin of safety		Relevant and appropriate. levels of unknown or anticipated adverse
Clean Water Act	33 USC 1251-1376			
Water Quality Criteria	40 CFR Part 131.36	Sets criteria for water quality based on toxicity to aquatic organisms and human health	Chemical	Relevant and appropriate. Aquifer may be a Federal Class IIA (discharge to surface water).
Criteria and Standards for the National Pollutant Discharge Elimination	40 CFR 125 1-3	Establishes criteria for water quality based on technology-based requirements in permits under the CWA	Chemical	Relevant and appropriate. Aquifer may be a Federal Class IIA (discharge to surface water).
General Pretreatment Regulations for Existing and	40 CFR 403.1-4, 8-11, 1B	Establishes responsibilities of federal, state, and local government and of the POTW in providing guidelines for and developing, submitting, approving, and modifying state pretreatment programs. Specifies standards for pretreatment.	Action	Applicable because of potential discharge to EAFB WWTP.
Guidelines Establishing Test Procedures for the Analysis of Pollutants	40 CFR 136 1-5 and App A-C	Specify analytical procedures for NPDES	Action	Applicable because of treatment and discharge of ground water.
General Program Requirements for injection	40 CFR 144.12	Prohibition of movement of fluids into underground sources of drinking water.	Action	Applicable to discharge options involving reinjection.
	40 CFR 144.13	Reinjection of treated contaminated groundwater.	Action	Applicable to discharge options involving reinjection.

Clean Air Act

National Primary and Secondary Ambient Air Quality Standard	40 CFR 50.1-6, 8, 9, 11, 12, and App A,H,J,K	Establishes standard for ambient air quality to protect public health and welfare.	Action	Applicable for discharge of off-gases for groundwater treatment processes.
National Emission Standards for Hazardous Air Pollutants	40 CFR 61.01. 12 40 CFR 61 240-247	Establishes regulatory standard for specific air	Action	Applicable. Several alternatives would require discharge to the air following treatment.
Land Disposal Restrictions	40 CFR 268 1-4, 268 7-43 except 268 42(b) and 268 50, App I- VII.	Identifies hazardous wastes that are restricted and from land disposal and defines those limited circumstances under which a prohibited may continue to be land disposed	Action	Relevant and Appropriate. Alternatives may include the disposal of residual waste due to treatment (e.g. spent carbon).
Executive Order on Protection of Wetlands	Exec. Order No 11,990 40 CFR 6.302(a) & Appendix A	Requires federal agencies to avoid, to th extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exists	Action/Location	Relevant and Appropriate. Alternatives wetland areas adjacent to potential remediation areas.

B. Potentially Applicable or Relevant and Appropriate State Standards, Requirements, Criteria, and Limitations

South Dakota Air Pollution Control Regulations	74:26:01:09, 24, 25, 26-28	Establishes permit requirement for construction, amendment, and operation of air discharge services	Action	Applicable to alternatives requiring discharge of off-gases
South Dakota Water Discharge Permit Rules	74:03:18:01-17	Establishes surface water discharge permit applications requirements	Action	Applicable for any discharge of treated ground water.
South Dakota Water Discharge Permit Rules	74:03:03:19.01-08	Establishes surface water permit conditions	Action	Applicable for any discharge of treated ground water
South Dakota Water Discharge Permit Rules	74:03.01	Establishes requirements for individual and small onsite wastewater systems	Action	Applicable for any discharge of treated ground water.
South Dakota Water Quality Standards	74:03:04:02,10	Defines use of Boxelder Creek and certain tributaries.	Action	Relevant and appropriate for any discharge of treated ground water.
South Dakota Remediation Criteria for Petroleum-Contaminated Soils	74:03:32	Establishes requirements for the remediation of soil contaminated with petroleum products.	Chemical	Relevant and appropriate. OU-1 has had impacts from petroleum products used during fire training activities.
South Dakota Ground Water Standards	74:03:15	Defines ground water classifications by	Chemical	Relevant and appropriate.

3.0 LIST OF ACRONYMS AND ABBREVIATIONS

1,2-DCA:	1,2-Dichloroethane
1,1-DCE:	1,1-Dichloroethylene
1,2-DCE:	1,2-Dichloroethylene
ACC:	Air Combat Command
ARARs:	Applicable or Relevant and Appropriate Requirements
ARSD:	Administrative Rules of South Dakota
CERCLA:	Comprehensive Environmental Response, Compensation and Liability Act
CFR:	Code of Federal Regulations
COC:	Chemicals of Concern
CRP:	Community Relations Plan
CWA:	Clean Water Act
EAFB:	Ellsworth Air Force Base
EPA:	Environmental Protection Agency
FAWQC:	Federal Ambient Water Quality Criteria
FFA:	Federal Facilities Agreement
FPTA:	Fire Protection Training Area
FS:	Feasibility Study
IRA:	Interim Remedial Action
IRP:	Installation Restoration Program
JP-4	Jet Propulsion Fuel Number Four; contains both kerosene and gasoline fractions.
MCL:	Maximum Contaminant Levels
µg/kg:	Micrograms per kilogram
µg/L:	Micrograms per liter
NCP:	National Oil and Hazardous Substances Contingency Plan
NPDES:	National Pollutant Discharge Elimination System
NPL:	National Priorities List
O&M:	Operation and Maintenance
OSHA:	Occupational Safety and Health Administration
OSWER:	Office of Solid Waste and Emergency Response
OU:	Operable Unit
PAH:	Polynuclear Aromatic Hydrocarbon
PCE:	Perchloroethylene; liquids used in degreasing or paint removal.
ppm:	Parts per Million
RA:	Remedial Action
RAB:	Restoration Advisory Board
RAO:	Remedial Action Objective
RI/FS:	Remedial Investigation/Feasibility Study
ROD:	Record of Decision
SARA:	Superfund Amendments and Reauthorization Act
SDDENR:	South Dakota Department of Environment and Natural Resources
SOP:	Standard Operating Procedures
SVE:	Soil Vapor Extraction
SVOC:	Semivolatile Organic Compound
TCE:	Trichloroethylene
TPH:	Total Petroleum Hydrocarbon
USAF:	United States Air Force
VOC:	Volatile Organic Compound

APPENDIX A

FIGURES

<IMG0896118AB>

<IMG0896118AC>

<IMG0896118AD>

<IMG0896118AE>

<IMG0896118AF>

APPENDIX B

RESPONSIVENESS SUMMARY

Remedial Action at Operable Unit One Ellsworth Air Force Base, South Dakota

1. Overview

The United States Air Force (USAF) established a public comment period from August 8 to October 16, 1995 for interested parties to review and comment on remedial alternatives considered and described in the Proposed Plan for Operable Unit One (OU-1). The Proposed Plan was prepared by the USAF in cooperation with the U.S. Environmental Protection Agency (USEPA) and the South Dakota Department of Environment and Natural Resources (SDDENR).

The USAF also held a public meeting at 6:30 p.m. on September 26, 1995 in the 28th Bomb Wing Auditorium at Ellsworth Air Force Base (EAFB) to outline the proposed remedy to reduce risk and control potential hazards at Operable Units 1,2, and 4.

Some of the public comments pertained to the selected remedies in the Proposed Plans for all the operable units. Rather than attempting to separate out the comments which pertained to an individual operable unit, one Responsiveness Summary was prepared to address all the comments for all the operable units.

The Responsiveness Summary provides a summary of comments and questions pertaining to OU-1, received from the community at the public meeting and during the public comment period, as well as the USAF's responses to public comments.

The Responsiveness Summary is organized into the following sections:

- Background on Community Involvement
- Summary of Comments and Questions Received During the Public Comment Period and USAF Responses
- Remaining Concerns

The selected remedy for OU-1 is alternative 3, source area soil and ground-water treatment which includes the following major components:

- Continued operation of the interim remedial action (IRA) which consisted of contaminated ground-water removal, soil vapor extraction (SVE), and treatment;
- Installation of additional SVE wells within the historical burn-pit area to be added to the existing IRA SVE system;
- Removal of contaminated ground water using additional ground-water wells and collection trenches to be added to the IRA ground-water recovery system;
- Treatment of ground water at the existing IRA treatment plant;
- Institutional controls for the area;
- Long-term monitoring; and,
- Long-term operation and maintenance of equipment.

2. Background on Community Involvement

On August 30, 1990 EAFB was listed on the USEPA's National Priorities List (NPL). A Federal Facilities Agreement (FFA) was signed in January 1992 by the Air Force, EPA, and the State and went into effect on April 1, 1992. The FFA establishes a procedural framework and schedule for developing, implementing, and monitoring appropriate response actions for EAFB.

Community relations activities that have taken place at EAFB to date include;

- FFA process. After preparation of the FFA by the USAF, EPA, and SDDENR, the document was published for comment. The FFA became effective April 1, 1992.
- Administrative Record. An Administrative Record for information was established in Building 8203 at EAFB. The Administrative Record contains information used to support USAF decision-making. All the documents in the Administrative Record are available to the public.
- Information repositories. An Administrative Record outline is located at the Rapid City Library (public repository).
- Community Relations Plan (CRP). The CRP was prepared and has been accepted by EPA and State of South Dakota and is currently being carried out. An update to this plan will be prepared in 1996.
- Restoration Advisory Board (RAB). The RAB has been formed to facilitate public input in the cleanup and meets quarterly. In addition to USAF, EPA, and South Dakota oversight personnel, the RAB includes community leaders and local representatives from the surrounding area.
- Mailing list. A mailing list of all interested parties in the community is maintained by EAFB and updated regularly.
- Fact sheet. A fact sheet describing the status of the IRP at EAFB was distributed to the mailing list addressees in 1992.
- Open house. An informational meeting on the status of the IRP and other environmental efforts at EAFB was held on May 6, 1993. An open house was held November 16, 1995 in conjunction with the Restoration Advisory Board meeting. Information on the status of environmental efforts at EAFB was provided at the open house.
- Newspaper articles. Articles have been written for the base newspaper regarding IRP activity.

The Proposed Plan for this remedial action was distributed to the mailing list addressees for their comments. Additional copies of the Proposed Plan were available at the September 26, 1995 public meeting. A transcript of comments, questions and responses provided during the public meeting was prepared.

3. Summary of Comments and Questions Received During the Public Comment Period and USAF Responses

Part I - Summary and Response to Local Community Concerns

Review of the written transcript of the public meeting did not indicate community objections to the proposed remedial action. No written comments were received during the public comment period.

The majority of the comments received during the public meeting for OUs 1,2, form of questions about the remedial investigation findings, the remedial action; i.e., what would be done, how it would be done, and what effects the action might have. In addition, one question addressed purchase of off-Base property. Representatives of the USAF were available to provide answers to the questions and also provided an overview presentation during the meeting to describe the proposed actions. The following are questions and responses pertaining to OU-1. For questions and responses pertaining to OU-2 and OU-4, refer to the Records of Decision for these OUs.

Part II - Comprehensive Response to Specific Technical, Legal and Miscellaneous Questions

The comments and questions below have been numbered in the order they appear in the written transcript of the September 26, 1995 public meeting.

Comment 1. Jan Deming

Asked about whether the stream running from the northeast to the southwest in OU-1 was contaminated, or was transporting contaminants.

Response 1: Evidence of jet fuel and pesticides were found in the sediments. The human health and ecological risk assessments indicated that there was no unacceptable risk to human and ecological

receptors. The storm drains were deferred to OU-11 to allow additional investigation of the ecological conditions on the Base. The oil/water skimmer in Pond 001 will remove any contamination floating on the pond surface if a fuel spill were to occur upstream of the OU. The monthly NPDES sampling for a range of chemicals helps ensure that no contamination is going off-Base.

4. Remaining Concerns

Based on review of the transcript of the oral comments received during the public meeting, there are no outstanding issues associated with implementation of the proposed remedial action.